

**ABSTRACT**

The illustrative embodiment is a simulation system for practicing vascular-access procedures without using human subjects. The simulator includes a data-processing system and a haptics interface device. The haptics device provides the physical interface at which an end effector (*e.g.*, medical instrument, such as a needle, catheter, *etc.*) is manipulated to simulate needle insertion, *etc.* In accordance with the illustrative embodiment, the haptics device includes a receiver. The receiver receives the end effector when it's inserted by a user into the haptics device. Sensors that are associated with the receiver monitor the motion and position of the end effector, generate signals indicative thereof, and transmit the signals to the data processing system. The signals are processed to determine the effects of manipulation of the end effector. In some embodiments, the signals are processed to determine the various resistive forces that would arise if the user were manipulating a needle/catheter through actual human anatomy. Responsive to this determination, the receiver generates forces that the user experiences as a resistance to continued advance (insertion) of the end effector. Simulated results are displayed by the computer system.